Letters to the Editor.

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A Type of Ideal Electric Atoms.

The *Philosophical Magazine* for December contains a long and interesting mathematical paper by R. Hargreaves, in which he explores possibilities of constructing self-subsisting orbital systems out of free massive positive ions combined with free negative electrons, held together by a rotation common to all. The solutions at which he arrives give a possible structure for an ideal atomic nucleus of the Rutherford type, namely, a revolving ring of alternate positive ions and negative electrons, with or without a positive ion at the centre or a number of ions lying along the central axis of the ring transverse to its plane. It is found that a limited number of structures of this type can subsist, stability requiring that the central charge shall be positive.

Analysis of the deformation of such a free ring by a field of electric or magnetic force yields striking results as regards the polarisations thereby produced, recalling cognate classical results obtained by Lord Kelvin and others long ago, relating to vortex rings in fluid. Around such a ring-nucleus outer electrons can describe orbits as satellites, either a few of them or many arranged in rings in the manner now familiar in illustrations of the outlying structure of atoms: their reactions on the ring-nucleus are analysed. So also are the reactions on the whole system of stray electrons or ions coming within its range from without, which may even combine with it in definite ways: interesting analogies to phenomena of ionisation and of emission of electrons come to light. The scale of magnitude of the system remains open to satisfy other conditions.

The author modestly disclaims authority to judge whether the properties he discovers have any substantial analogy with the radio-active and spectroscopic phenomena of actual atoms. But, apart from the mathematical interest, there can be no question that the result of such a systematic rigorous analysis of the dynamical behaviour of a definite group of free systems, proved to be possible and stable, is calculated to expand the range of ideas in this field of physical speculation, and so is well worth the labour it has entailed. The alternating arrangement of ions and electrons in the nuclear ring calls to mind recent theories in the very different domain of crystalline structure and conductance in metals, based on space-lattices in which metallic ions and electrons occur alternately. J. L.

Cambridge and the Royal Commission.

Kindly permit me to reply to the criticisms in Nature of November 25, p. 689, on my article in the *Quarterly Review*. (1) I note with satisfaction that my critic admits that "many of those who do not share [my] fears will agree with [me]" on the importance of having the proposed grants "charged on the Consolidated Fund." My fears arise from (*a*) the declaration made to the Commission by the Labour Party that the "control of the Universities merely by statute assisted by occasional Royal Commissions has now definitely failed and that something in the nature of a continuous administrative control by the State must be undertaken," and (*b*) from the imperious demand that this control should be exercised "by representatives of Trades Unions, Elementary School Teachers, Women's Organisations, County Councils, the Board of Education, etc." (Report, p. 72, *Q.R.*, pp. 350-351). Are my fears groundless in view of the fate which has befallen the Universities of France, Germany, and Holland, under State control?

(2) My critic tries to defend the proposal to hand over the control of all teaching and research to the Council, a political body, largely composed of men whose interests are in administration rather than in the advancement of knowledge, and seeks to justify this by the vague statement that "the electorate which chooses both bodies is the same," leaving out of sight the fact that the elections to the Council are almost wholly on very clearly defined party lines with little regard to educational questions. It is proposed to supersede the General Board of Studies (composed of representatives of the 14 Special Boards of Studies and 8 nominated by the Council chiefly from their own members) by a new Board of Studies and Research subordinate to the Council, to consist of 12: 6 appointed by the Council and 6 only by the whole body of University and College teachers. As the General Board has on it representatives of all the Special Boards the co-ordination of the various studies and a proper standard for the higher Doctorates can thus be, and is, well maintained. The bureaucrats hate the General Board because they cannot prevent the Special Boards from placing on it their leading men, no matter what their politics may be. The General Board is charged with being "unwieldy," and at the same time not wholly representative of all branches of study, and that "its co-ordinating functions seem to be impeded to some extent by the fact that it is largely composed of specialists." The animus shown against "specialists" gives the key.

My critic does not attempt to meet my statements that it is not "unwieldy" since it has the same number as the Oxford Council (23), that it does its work excellently, while the Council, when it interferes with education, deals badly with it and is slovenly in its routine business. If the General Board is "not wholly representative of all branches of study," then the new Board of 12 will be much less so, and the evil effects of such a Board are already felt in the new Board of Research set up by the Council to deal with applicants for the Ph.D.

(3) With regard to the disfranchisement of the Senate, my critic says that "In his criticism of detail Sir William Ridgeway is not happy. When he says 'The Cambridge Commissioners know perfectly well that it would not be easy to get fifty signatures to any appeal within a week,' the obvious answer is that Sir William Ridgeway knows perfectly well that in any issue of importance where an appeal to the Senate is likely, fifty signatures could be collected in the Senate-House from the defeated minority," etc. Here are my actual words: "It would not be easy to get fifty signatures to any appeal within a week, and to get those of one-third of the House of Residents within 14 days would be impossible in view of the further proposal that if a Grace passed by the House of Residents were rejected by the Senate, that Grace could be re-affirmed within two terms and become final." No one would think of getting up, or signing, an appeal to the Non-Residents to waste their time and money in coming to oppose a measure (nor if asked would they come) which even if defeated by the Senate would become law in two terms. As my critic has not dared to challenge any of my facts, his only resort was to impugn my honesty by garbling my statement, an attempt as futile as disingenuous. He repeats the charge that the control of the Senate is "capricious," because "its interven-

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tion is made at the capricious decision of a body of resident conservatives who, through the Senate, wield a wholly disproportionate power on matters vitally affecting the well-being of the University." Yet he had just admitted that only thrice in twenty-five years has the Senate come up in force, and that only once did it outvote the resident majority. His picture of wicked conservatives "constantly" calling up non-residents to oppose progressive Radicals is just as devoid of fact as the assumption that Radicals are always progressive.

When, in 1910, a like charge was made against the Senate, I recited in the Senate-House a list of much-needed reforms and progressive measures (in all of which I was concerned), *e.g.* a proper audit and control of Departmental funds, the reform of the Press, the reform of the Fizwilliam Museum, the founding of the Departments of Anthropology and of Architecture, etc., etc. (all of which had later to be carried out), and I charged to their faces the Radical leaders who then controlled the Council, with heading the obstruction to all these reforms. No one then or since has disputed my allegations. The suggestion that resident conservatives are an insignificant body is disproved by our important gains in the late elections to the Council (even without the much-needed secret ballot). My critic does not deny that the proposals of the Report respecting the powers of the Senate, the constitution of the Council and of the Board of Studies and Research go much further than the proposals made by the committee of younger graduates (men under 40) who represent the most advanced opinion among residents. They wish that the ultimate decision on statutes should rest with the Senate, and that the professoriate should keep its representation on the Council, and have some on the proposed new Board of Studies.

WILLIAM RIDGEWAY.

Flendyshe, Fen Ditton, Cambridge,
December 2.

LEAVING on one side the more personal aspects of Sir William Ridgeway's letter—his zeal for progressive reforms and the disingenuousness of his critic—a reply may be made to one or two of the points raised by him. He is mistaken in saying that the committee of younger graduates (men under 40) represent the most advanced opinion among residents. They have not unfairly been nicknamed "The Cambridge Whigs." Even this body, however, has suggested that members of the General Board (or Board of Studies and Research) should be nominated by the Council and that the Board should be reduced in size by abandoning the direct representation of the Special Boards of Study. It is held by many, who are equally keen with Sir William Ridgeway on the independent development of educational policy in the University, that the best solution lies in a small Board akin to the present Board of Research Studies, well balanced between the different faculties and working in close co-operation with the Special Boards. As to the question whether an appeal against the House of Residents would ever be made under the Commission's scheme, the writer differs absolutely from Sir William Ridgeway. Differences of opinion are too acute, and the fighting spirit of both sides too strong, to allow certain proposals to pass without a stern contest at every possible point.

THE WRITER OF THE ARTICLE.

Gravity Variations.

MR. R. D. OLDHAM'S letter in NATURE of November 18, p. 665, makes the disquieting suggestion that the force of gravity at Dehra Dun may be subject to fluctuations. The changes that he points out in the times of oscillation of the Indian pendulums can, however, be quite reasonably attributed to alterations in the lengths of the pendulums and errors of observation, and are not, in my opinion, so grave as to warrant a belief in anything more fundamental. As Mr. Oldham says, there is neither proof nor disproof of a change in gravity. But the discussion undoubtedly indicates a weak spot in the Indian operations, namely the connexion of Dehra Dun with Kew Observatory, which is the base station for this country. It rests on the results obtained with four pendulums swung at Kew and then transported to Dehra Dun and swung there. The pendulums have never been brought back to this country, so if they suffered any changes of length on the journey from Kew to Dehra Dun the value of *g* found at the latter place will be erroneous.

It would, of course, have been necessary to undertake a return journey long ago if no corroboration of the result of the first journey had been available. There was, however, the strong corroboration afforded by Hecker's observations in 1905, as mentioned by Mr. Oldham, and the valuable though less powerful evidence obtained by Alessio in 1906. Hecker's result was of special value because at Jalpaiguri his apparatus was set up alongside the Indian one and simultaneous observations were made using the same clock. Thus there was good reason to believe that the effects of fluctuations of temperature and variations in the clock's rate—the chief sources of uncertainty—would be the same on both sets of observations, and that therefore the check on the Dehra Dun value of *g* would be nearly as satisfactory as if Dr. Hecker's pendulums had been swung at Dehra Dun itself.

The links forming the connexion of Dehra Dun with the value of *g* determined at Potsdam are as follows:

	Result.
Potsdam—Kew (Putnam, 1900) Kew—Dehra Dun (Indian operations, 1904)	979·063
Potsdam—Jalpaiguri (Hecker, 1905) Jalpaiguri—Dehra Dun (Indian, 1905) .	979·065
Potsdam—Genoa Genoa—Bombay (Alessio, 1906) Bombay—Dehra Dun (Indian, 1904) .	979·059

The probable error of each of these results may be estimated to be between ±0·003 and ±0·005. The agreement between them is therefore better than the probable errors would have allowed us to anticipate.

Commander Alessio's observations in 1913–14, however, give a value of 979·079 for *g* at Dehra Dun, which differs from the above by nearly four times the probable error.

Alessio's observations were most carefully made with a strong equipment of eight pendulums, and carry great weight. They have not, so far as I am aware, been published in detail as yet, and it is not possible to form a final judgment on them; but in the article in the *Rivista Marittima* quoted by Mr. Oldham, there is a remark which may perhaps indicate a weak point. Commander Alessio says that the comparison of the times of oscillation of the pendulums at Genoa before and after the journey show that certain changes had taken place in the lengths of the individual pendulums, but that fortunately the length of the mean of the eight pendulums had remained absolutely unchanged. If the changes in the individual pendulums were large, and if they, or any of them, took place before the pendulums reached Dehra Dun, then the deduced value of *g* at Dehra Dun may be burdened with a considerable error.

Whatever opinion may be formed when the whole of the details of Commander Alessio's work are avail-

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